A.D. 1869, 10*th* DECEMBER. N° 3569.

SPECIFICATION

OF

GEORGE FOX LOGAN.

UTILIZING WASTE HEAT AND CONSUMING SMOKE, &c.

LONDON:

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1870.

A.D. 1869, 10*th* DECEMBER. N° 3569.

Utilizing Waste Heat and Consuming Smoke, &c.

LETTERS PATENT to George Fox Logan, of Glasgow, in the County of Lanark, North Britain, for the Invention of "A NEW OR IMPROVED MEANS FOR UTILIZING WASTE HEAT AND FOR CONSUMING SMOKE, WHICH IS ALSO APPLICABLE FOR DRAWING OFF AND CONSUMING NOXIOUS GASES OR VAPOURS."

Sealed the 20th May 1870, and dated the 10th December 1869.

PROVISIONAL SPECIFICATION left by the said George Fox Logan at the Office of the Commissioners of Patents, with his Petition, on the 10th December 1869.

I, GEORGE FOX LOGAN, of Glasgow, in the County of Lanark, North Britain, do hereby declare the nature of the said Invention of "A NEW OR IMPROVED MEANS FOR UTILIZING WASTE HEAT AND FOR CONSUMING SMOKE, WHICH IS ALSO APPLICABLE FOR DRAWING OFF AND CONSUMING NOXIOUS GASES OR VAPOURS," to be as follows, that is to say:—

This Invention, which relates to improvements in means employed in connection with furnaces generally, whereby fuel is economised and

smoke to a greater or less extent is consumed, and which means may also be applied for withdrawing gases or noxious vapours from sewers or other places wherein they accumulate, consists in the employment of one or more pipes, tubes, or passages of a syphon or other form.

For the sake of simplicity in the succeeding part of this Specification one such pipe, tube, or passage is referred to, it being understood that any other number of such pipes, tubes, or passages may be applied according to the conditions attending each application.

The pipe, tube, or passage is placed in the flue, chimney, smoke box, or other cavity which receives the waste products of combustion of the furnace, and when used for economising fuel and burning the smoke one end of the pipe, tube, or passage passes to the outside of the flue, chimney, smoke box, or other cavity, and is therefore in direct communication with the atmosphere, whilst the inner end of the pipe, tube, or passage communicates with the furnace proper in such position as to discharge the air passing in through it at a point where it enters into admixture with the heated smoke and unburnt products passing from the furnace, and the air being heated on its progress through the pipe, tube, or passage reaches the smoke and unburnt products in a heated state, so that the combustion of the latter is ensured. In some cases it may be necessary to employ a steam jet or an air jet to render the current of air through the pipe, tube, or passage sufficiently powerful.

When the pipe, tube, or passage herein-before set forth is used for drawing off noxious gases from sewers or other places its outer end is so placed that the noxious gases may be drawn into it and discharged into a fire whereby they are consumed.

As constituting this Invention, and as novel and original, it is not intended to claim the admixture of heated air with the smoke and unburnt products escaping from furnaces, or the consumption of noxious gases by passing them through burning fuel, but it is intended to claim the means by which these results are effected, as herein-before described, and consisting in the placing of syphon or other shaped pipes, tubes, or passages in the flues, chimneys, smoke box, or other cavity receiving the waste products of combustion from the furnace.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said George Fox Logan in the Great Seal Patent Office on the 9th June 1870.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, GEORGE FOX LOGAN, of Glasgow, in the County of Lanark, North Britain, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Tenth day of December, in the year of our Lord One thousand eight hundred and sixty-nine, in the 33d year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said George Fox Logan, Her special license that I, the said George Fox Logan, my executors, administrators, and assigns, or such others as I, the said George Fox Logan, my executors, administrators, or assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "A NEW OR IMPROVED MEANS FOR UTILIZING WASTE HEAT AND FOR CONSUMING SMOKE, WHICH IS ALSO APPLICABLE FOR DRAWING OFF AND CONSUMING NOXIOUS GASES OR VAPOURS," upon the condition (amongst others) that I, the said George Fox Logan, by an instrument in writing under my hand and seal, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said George Fox Logan, do hereby declare the nature of my said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement, reference being had to the accompanying Drawings, and to the letters and figures marked thereon, that is to say:—

My said Invention, which relates to improvements in means employed in connection with furnaces generally, whereby fuel is economised and smoke to a greater or less extent is consumed, and which means may also be applied for withdrawing gases or noxious vapours from sewers,

ships' holds, berths, buildings, houses, or other places wherein they accumulate, consists in the employment of one or more pipes, tubes, or passages of a syphon or other form.

For the sake of simplicity in the succeeding part of this Specification one such pipe, tube, or passage is referred to, it being understood that any other number of such pipes, tubes, or passages may be applied according to the conditions attending each application.

The pipe, tube, or passage is placed in the flue, chimney, smoke box, or other cavity which receives the waste products of combustion of the furnace, and when used for economising fuel and burning the smoke one end of the pipe, tube, or passage passes to the outside of the flue, chimney, smoke box, or other cavity, and is therefore in direct communication with the atmosphere, whilst the inner end of the pipe, tube, or passage communicates with the furnace proper in such position as to discharge the air passing in through it at a point where it enters into admixture with the heated smoke and unburnt products passing from the furnace, and the air being heated in its progress through the pipe, tube, or passage reaches the smoke and unburnt products in a heated state, so that the combustion of the latter is ensured. In some cases it may be necessary to employ a steam jet or an air jet to render the current of air through the pipe, tube, or passage sufficiently powerful.

When the pipe, tube, or passage herein-before set forth is used for drawing off noxious gases from sewers, ships' holds, berths, buildings, houses, or other places its outer end is so placed that the noxious gases may be drawn into it and discharged into a fire whereby they are consumed.

And in order that my said Invention may be properly understood I now proceed more particularly to set forth the system, mode, or manner in or under which the same is or may be used or practically carried into effect, that is to say,—

At Figure 1, on Sheet 1, my said Invention is shown applied to the furnace of an ordinary outside flue boiler A, and it consists in placing one or more pipes, tubes, or passages B of the form or approximately of the form shown in such a position that one of the ends of each such pipe, tube, or passage projects through the side of the chimney or stalk C, and consequently is in direct communication with the atmosphere, whilst the other end is placed in or near the furnace D, so that the air entering by the outer end of the tube B is heated in passing to the

opposite end by the smoke and heated gases in the chimney C enveloping the exterior surface, and on issuing from such opposite or inner ends the said heated air mixes with the unburnt gases there collected, and supplying to them oxygen in a heated state ensures their more complete combustion, lessening the quantity of smoke which would otherwise be caused by the incomplete combustion of the gases, and thereby utilizing a large portion of the heat which would otherwise escape as waste. In lieu of placing the furnace end of the tube or passage B in the position shown in the Drawing, namely, at or behind the bridge E, it may be carried (as shown in dotted lines on the Drawing) underneath the fire-bars *a*, up the fire door end of the furnace D, and forming a curve at the top of the furnace admit the air to the gases in a still hotter state than when discharged at the bridge E; or the said tubes B may have the branch shown in dotted lines in addition to the opening at the bridge E.

Figure 2 shows a longitudinal section of a marine boiler A with my Invention applied thereto. As in the case herein-before described the tube or passage B is placed with one end projecting through the chimney C, and passing down the chimney C enters the furnace D above or near the fire door *b*. The action of the air in this modification is similar to that in the herein-before described modification, and therefore need not be further specified.

At Figure 3 is represented a longitudinal section of a reheating, ball, scrap, or puddling furnace A shewing the application of my Invention thereto. In this as in the former cases the tube or passage B is placed with one end projecting into the atmosphere through the side of the chimney C, but the other end of the tube instead of passing along in the interior of the furnace is carried (after having in the same manner, as in the preceding Figures, proceeded up one side of the chimney C and down the other side, as shown in the form of a syphon, in order to obtain sufficient surface to heat the air passing through it) out through the side of the chimney C opposite to that at which the air enters the tube or passage B, and is conducted along the exterior of the roof or other part of the furnace A, and part way down the end opposite to the chimney C, where it enters the combustion chamber D and discharges the heated air, which then mixes with the unburnt gases, whereby they are more effectually consumed.

Figure 1, on Sheet 2, represents a vertical section of a blast furnace or ordinary foundry cupola A having my Invention for utilizing waste

heat applied thereto, and it consists in placing a cylinder or box C having a series of tubes D fixed vertically in it over the opening at the top of the cupola A. The lower ends of the tubes D are in direct communication with the cupola, and their upper ends are open to the atmosphere, so that the heated gases and products of combustion pass through the tubes D into the atmosphere. In passing through the tubes D the heated gases and products of combustion heat the air which enters the box or cylinder C by the openings *a*, and this heated air passes down the tubes or passages B into the twyer nozzles E, and is thence carried into the cupola with the blast which enters from the blast pipes F. The heated air on being thus carried into the cupola ensures a more efficient action in it, and effects economy in the fuel by regenerating a large portion of the heat, which in existing cupolas passes off into the atmosphere and is wasted.

Figures 2 and 3 represent respectively a vertical section and plan of a modification of the arrangement shown at Figure 1. The cold air entering by the tubes or passages F passes into the chamber C, where it is heated by the smoke and unburnt products of combustion escaping from the cupola through the tubes or passages D fixed in the chamber C, and passing thence down the tubes or passages B into the twyer nozzles it is carried into the cupola, as herein-before described with reference to Figure 1 of this Sheet of Drawings.

In furnaces arranged with my Invention, as shown at Figures 1, 2, and 3, on Sheet 1, and at Figures 1, 2, and 3, Sheet 2, a jet of steam may or may not be introduced into the tubes or passages B to render the current of air passing through them sufficiently energetic and effective.

Figure 4, Sheet 2, shews a section through the fire-grate of two ordinary apartments of a house having that modification of my Invention applied which relates to the drawing off of noxious gases, vapours, or impure air from places where they accumulate. A tube or passage A is placed over the fire-place against the wall, and has an opening *a* preferably with a bell mouth, as shown, near the ceiling. The lower end of the tube or passage A enters the chimney B by being passed through the wall just above the chimney piece *b*, as shown, or the tube or passage A may enter the chimney at any other suitable part, and where it (the tube) is fixed to a perforated pipe or tube C placed against the interior wall at right angles to the tube or passage A.

The noxious and heated gases, vapours, or impure air which collect in the room pass into the tube A at the bell-mouth opening *a*, and thence pass down the tube A into the perforated tube C, whence they are discharged into the chimney B, being induced thereinto by the action of the heat of the fire, or the perforated pipe or tube C and the draught in the chimney. The communication between the chimney and the tube or passage A may when required be cut off by turning the handle of the valve *c* in the necessary direction.

From what is herein set forth in reference to the modification last described it will be understood that noxious gases may in the same manner be drawn off from sewers, ships' holds, berths, buildings, houses, or other places where they accumulate, and be discharged into a fire and destroyed.

Figures 5 and 6, Sheet 2, are respectively a front elevation and side elevation of an improved fire-grate constructed accordingly with my Invention. The gases are drawn off from the apartment by means of a tube or pipes so placed as to cause them to pass through the opening *a* and a^1 of the pipes or tubes A and A^1, and pass down these tubes A and A^1 into the boxes B at the back of the grate, whence they are discharged into the chimney by means of the valve D regulated by the handle *c*, where they are consumed. This modification may also be used for heating apartments by closing the valve D, when the air entering by the openings *a*, a^1, of the tubes A, A^1, passes into the boxes B, where it is heated, and the valve D being closed it passes through the openings *b*, b^1, of the tubes A, A^1, whence it may be conducted to any part of the apartment, or to a separate apartment, thereby constituting a heating apparatus. When used as a heating apparatus the tubes A, A^1, are carried to the outside of the house or building, and fresh air is thereby caused to pass through the tubes. The surface of the front plate *d* of the grate is preferably of a corrugated form in order to increase the surface for discharging the heat.

It is to be understood that in carrying out my Invention, whether it be applied to boilers, furnaces, cupolas, or fire-grates already in existence, or for withdrawing noxious gas, vapours, or impure air from ships' holds, buildings, houses, sewers, or other places, or to boilers, furnaces, cupolas, or fire-grates newly constructed, any number of the pipes, tubes, or passages herein-before referred to may be employed.

Logan's Method of Utilizing Waste Heat and Consuming Smoke, &c.

It is further to be understood that the apparatus herein-before described and shown on the appended Sheets of Drawings is applicable to furnaces other than those herein-before set forth, such, for example, as furnaces for heating ship and boiler plates.

Having now described the nature of my said Invention, and the system, mode, or manner in or under which the same is or may be used or practically carried into effect, I would observe in conclusion that what I consider novel and original, and therefore claim as the Invention secured to me by the herein-before in part recited Letters Patent is, the use and application of any required number of pipes, tubes, or passages in connection with the furnaces of boilers and other furnaces and fire-grates; also the application of such pipes, tubes, or passages for withdrawing noxious gases, vapours, and impure air, substantially as herein-before described.

In witness whereof, I, the said George Fox Logan, have hereunto set my hand and seal, this Eighth day of June One thousand eight hundred and seventy.

GEORGE F. LOGAN. (L.S.)

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1870.

FIG. 1.

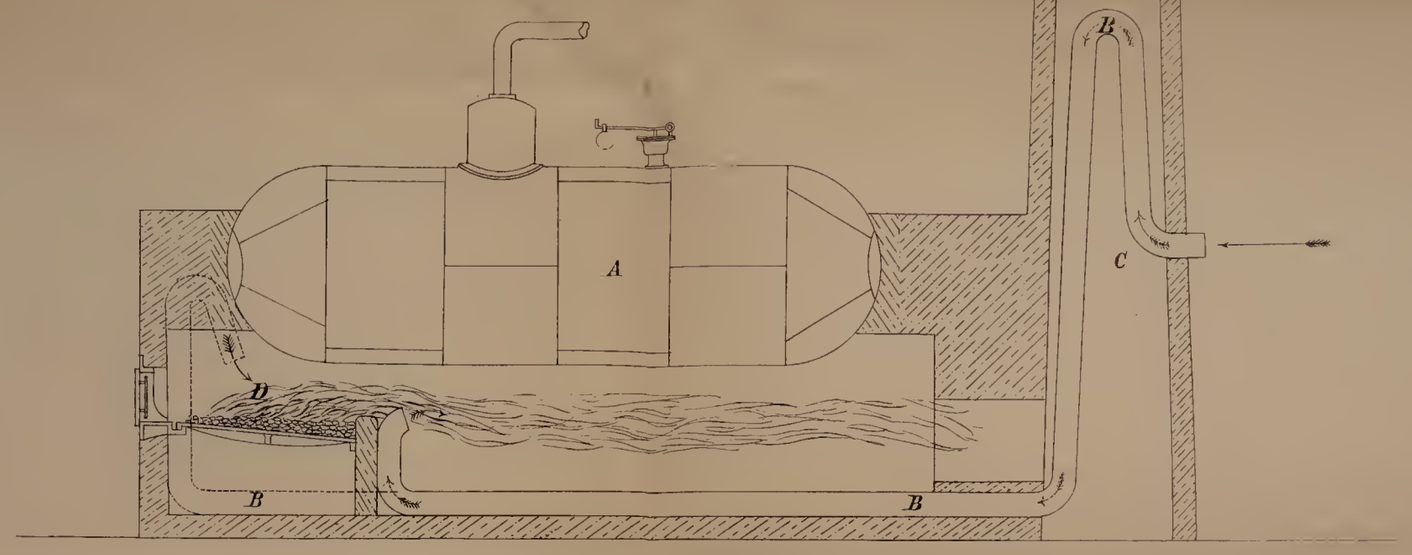


FIG. 2.

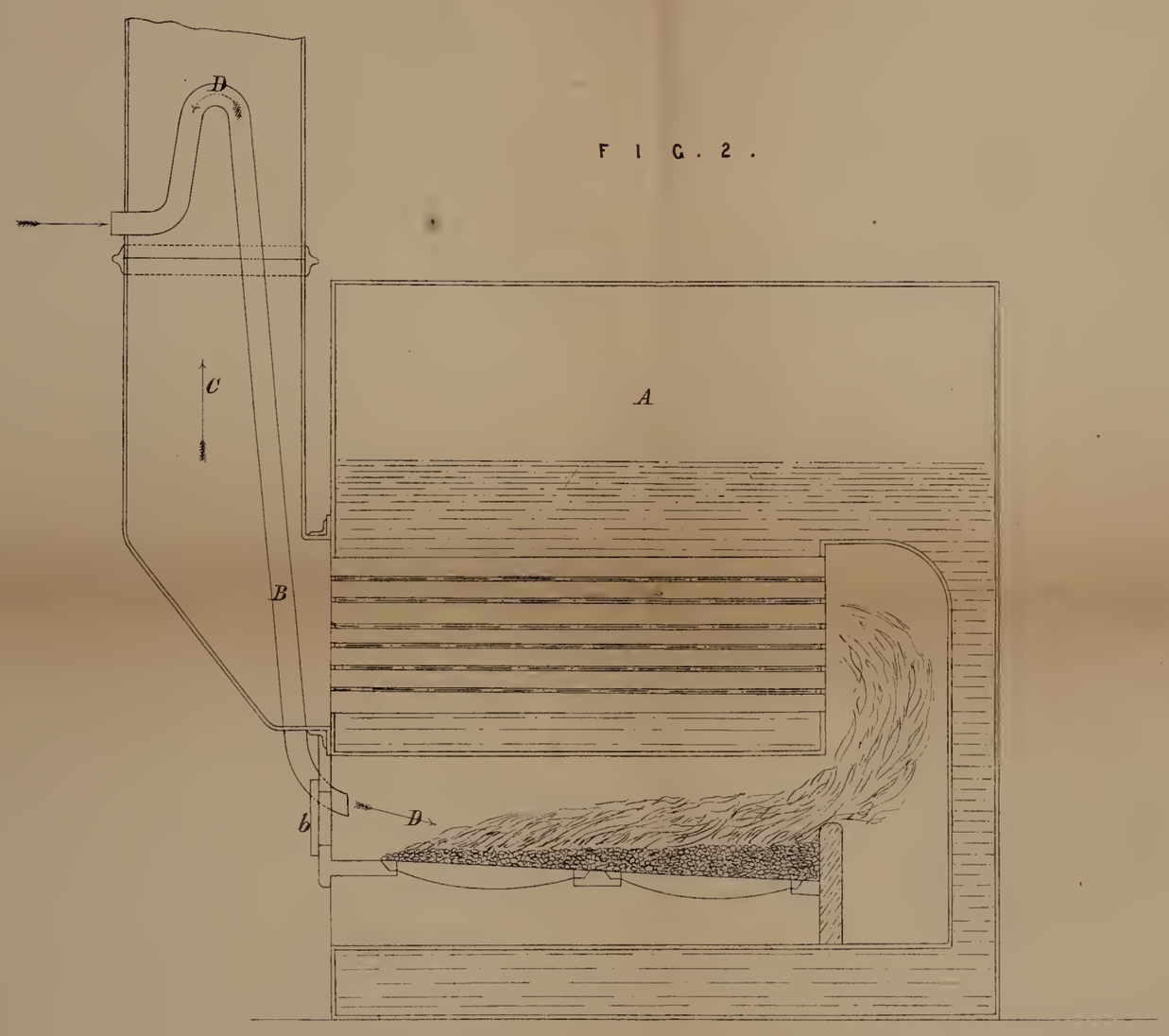
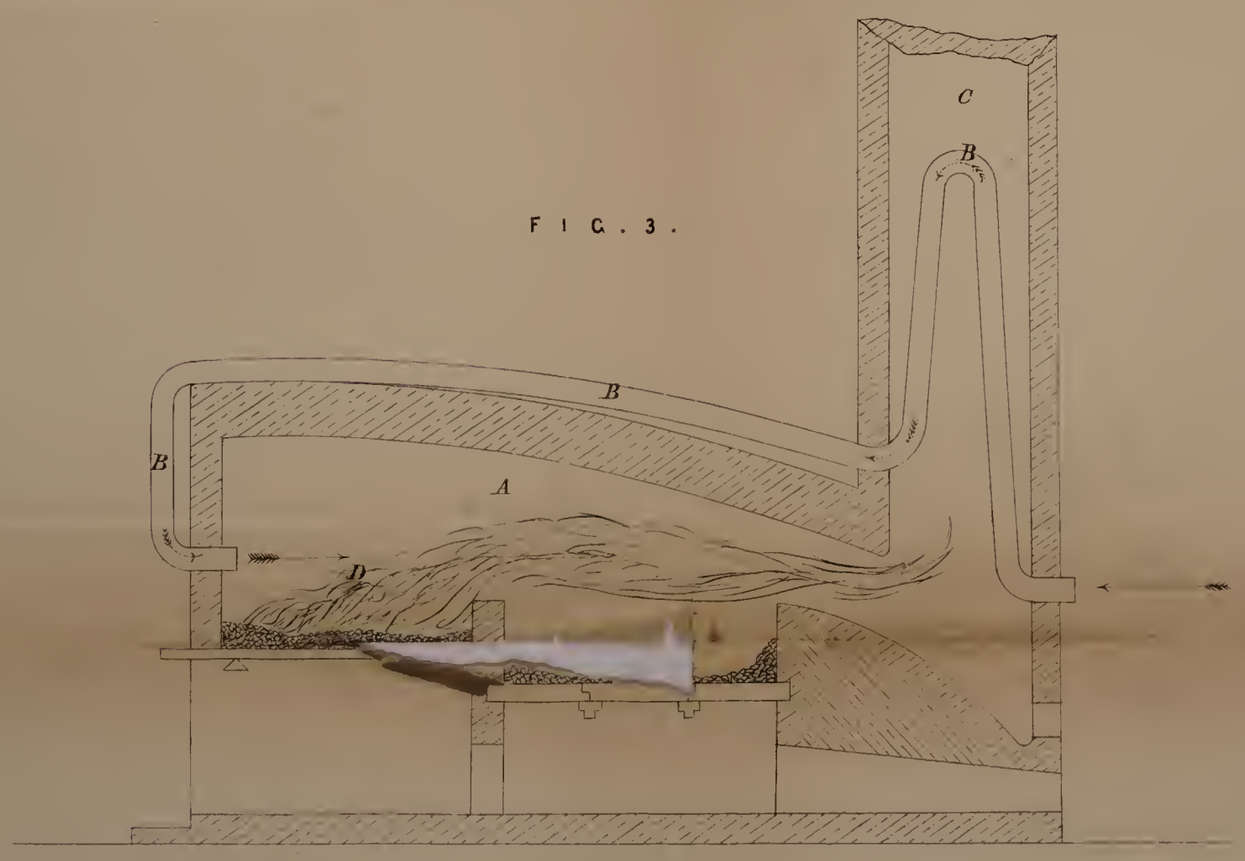


FIG. 3.



The filed drawing is partly colored

Drawn [illegible] By Malby & Sons

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LOGAN'S Specification.

(2 SHEETS)
SHEET 2

FIG. 1.

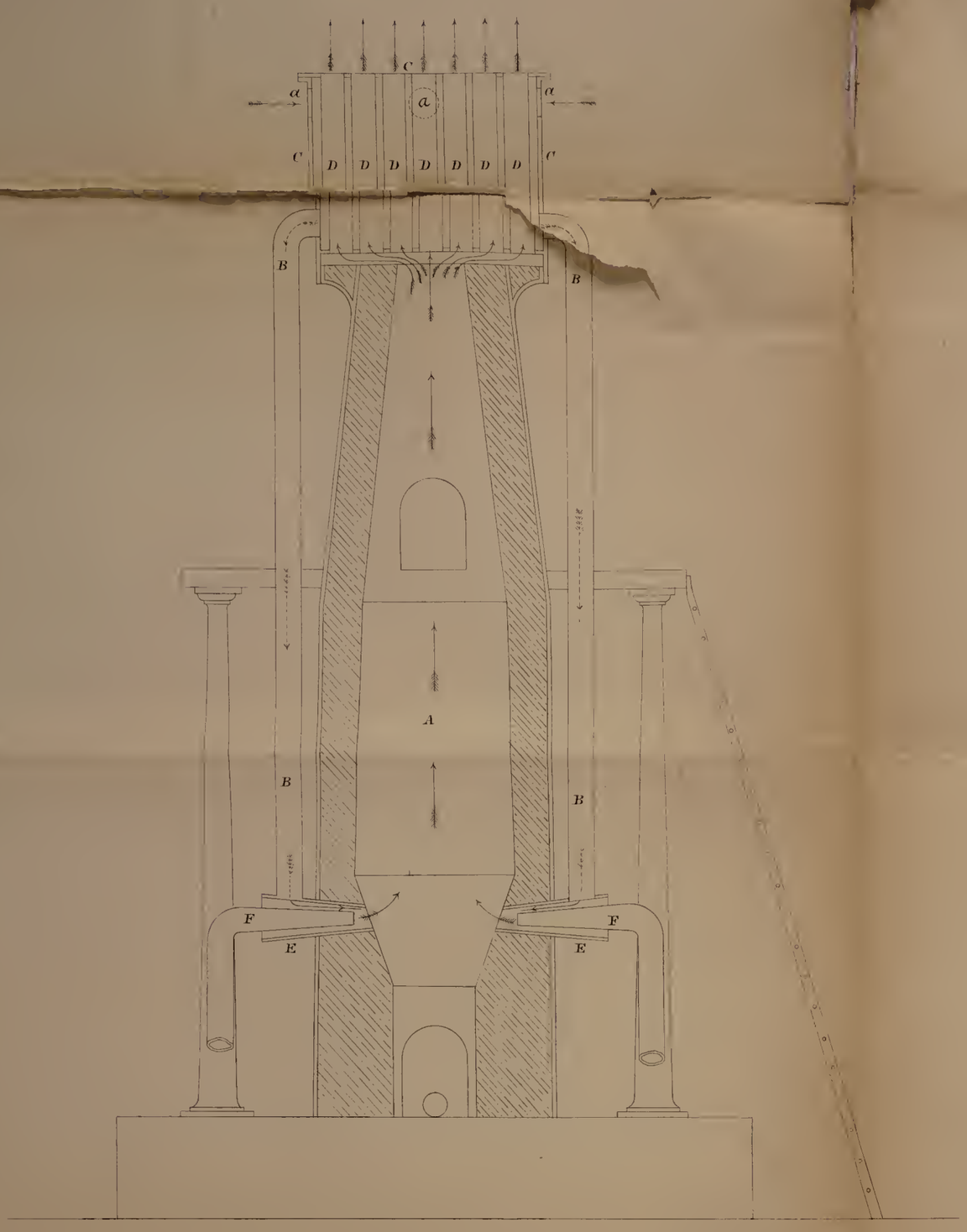


FIG. 2.

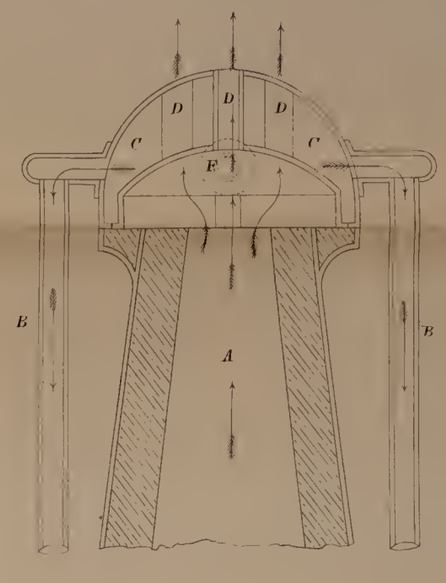


FIG. 3.

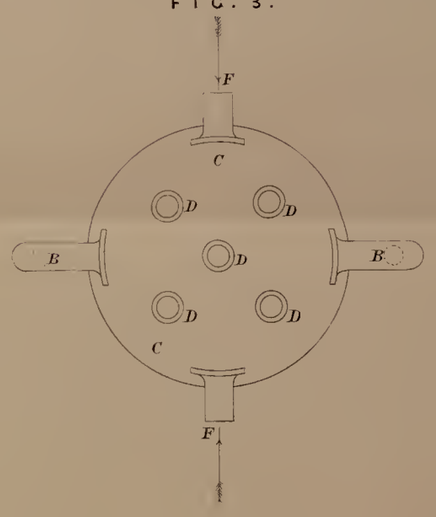


FIG. 4.

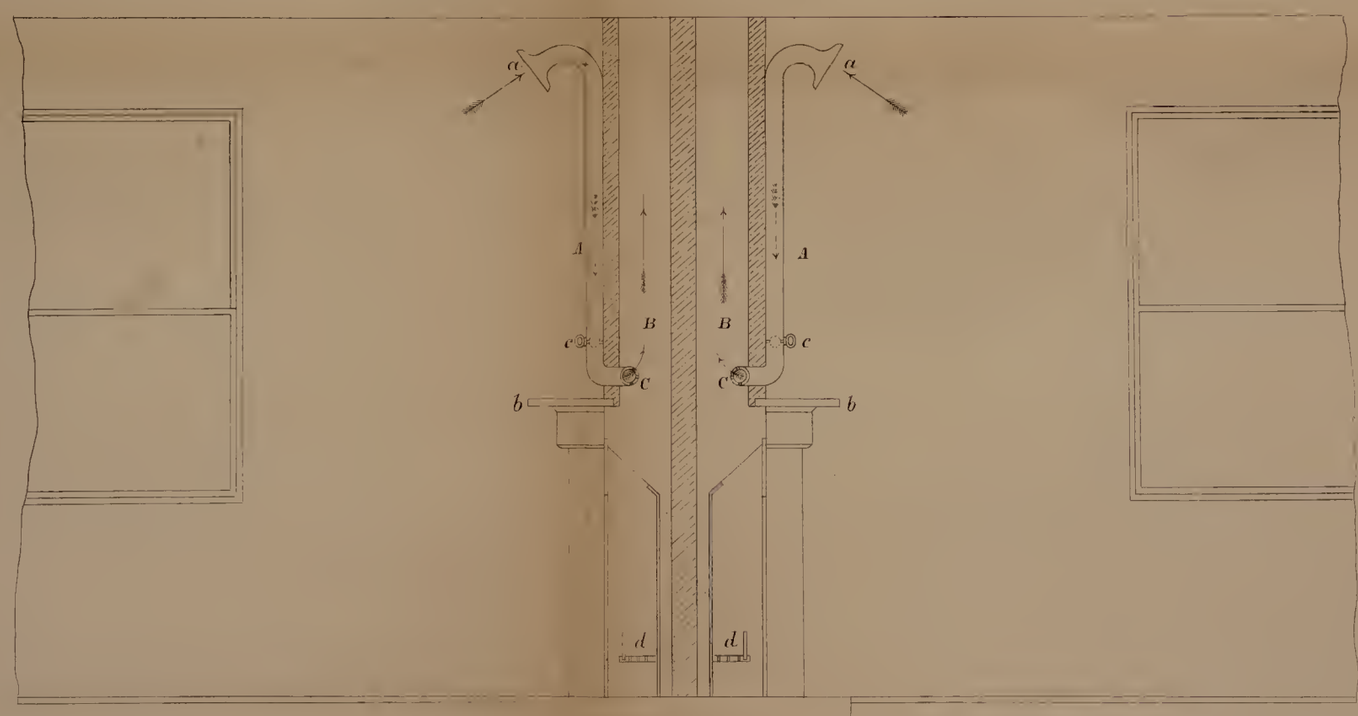


FIG. 5.

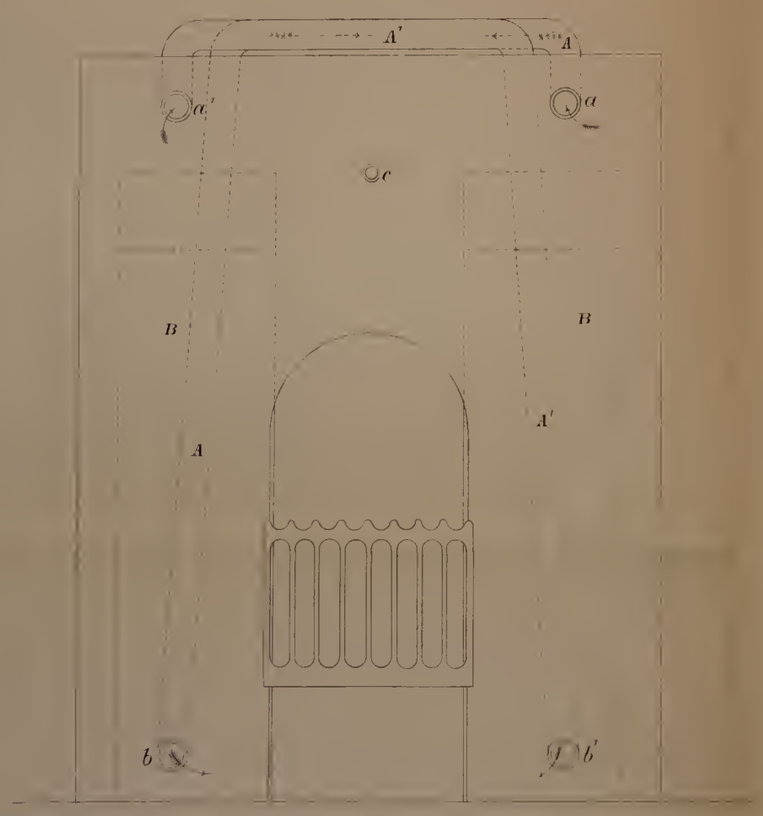
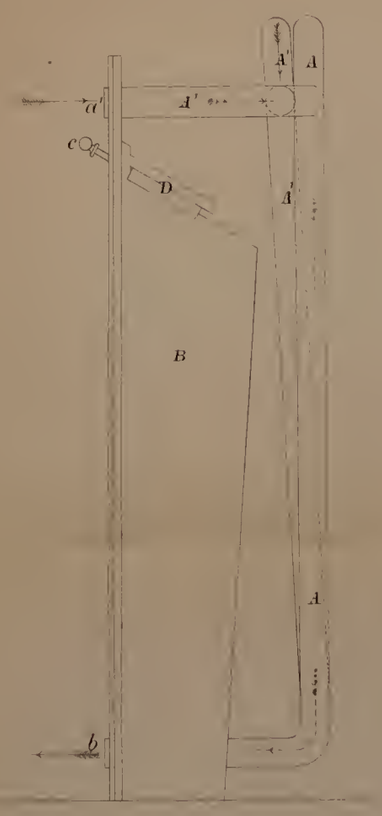


FIG. 6.



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